MEMORANDUM

SUBJECT: Comments on "Why the CIA's Estimate of Soviet Defense Procurement Was Off by 200%: The Economic Consequences of Quality Change" by Steven Rosefielde

1. Professor Rosefielde's paper represents a laudable theoretical enquiry into a number of technical but crucial elements of dollar costing and some potential biases which would result from a mishandling of these elements. We appreciate Professor Rosefielde's interest in and scholarly effort on these topics which are rarely pursued by non-government economists.

2. Upon examination of his arguments, however, it is clear that Dr. Rosefielde is only vaguely familiar with our costing procedures. Because the crux of his arguments is based on his (erroneous) perceptions of our procedures, his conclusions on supposed biases are not directly relevant to our estimates.

Major Issues

Costing Models

3. On page 9, Rosefielde poses the question "How do CIA input cost indices of Soviet procurement take account of technical progress in the form of new weapons, and quality change expressed by improved characteristics of traditional weapons?" He then states that "an exact answer to this question would require an exhaustive analysis of the costing equations themselves to ascertain how thoroughly they were updated and the principles that were applied in the adjustment process. Since the author has, for understandable reasons, been unable to directly appraise the costing equations, our analysis must be confined to the conceptual problem of valuing systems in a period of rapid technical change." (emphasis added)

4. Given this lack of information, Rosefielde postulates two potential problem areas.

-- Underestimating the technical characteristics of Soviet weapons, and

-- Using "outmoded" cost equations.

5. The first problem cannot be addressed in detail without discussing sensitive intelligence sources and methods. We believe, however, that the intelligence community's estimates of the characteristics of most existing Soviet weapons are sufficiently reliable to support our costing work. Furthermore, there is no reason to expect on an a priori basis that intelligence judgements would systematically understate (rather than overstate) the performance characteristics of these weapons. In fact, the latter might be more expected.

6. Regarding the cost models, we maintain a continuing effort to develop and refine our techniques. Almost every costing model for major weapons or weapons components has been thoroughly revised within the past five years. Finally, we are cognizant of the issue raised by Professor Rosefielde regarding potential biases introduced by technical progress and quality change. Adjustment of our models to eliminate these biases is a major goal of our research.

Index Numbers

7. Rosefielde also addresses a problem inherent to intertemporal and international comparisons of economic activity known as the index number problem. He notes correctly that the choice of weights can overstate or understate a comparison over time or space. His commentary on the index number problem per se is valid, but once again his perception of the Agency's procedures is inaccurate. not quite

8. Finally, the significant issues include not only the type of index used (Laspeyres, Paasche or ideal), but also the problems inherent in construction of price indices (of any type) for products of rapidly changing quality sold in a non-competitive market. We have given careful attention to this problem and believe that we would have useful insights to offer to Professor Rosefielde.

Recommendation

9. We are both gratified that Dr. Rosefielde has such keen interest in this often ignored area of economic

research and ~~disturbed~~ concerned that his lack of adequate background data or ~~in~~ how we conduct our analysis has resulted in his ~~questioning the integrity of our statements~~ raising issues. We believe there is a reasonable solution to this state of affairs. We would like to extend an invitation to Dr. Rosefielde to meet with us and review our data and procedures.

In which we believe there are answers

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IN REPLY REFER TO:
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27 September 1977

Admiral Stansfield Turner
Director of Intelligence
Central Intelligence Agency (CIA)
Washington, D.C. 20505

Dear Stan,

This is a somewhat belated follow-up to our conversation at Admiral Holloway's house early in the summer in which I mentioned to you a very able young Soviet economist, Steven Rosefielde, who has taken a serious interest in understanding how the CIA estimates of Soviet defense expenditures got out of wack. Although both he and I think much toomuch time has been devoted to this subject in general, we both think that there is a real possibility that the growth rate of Soviet defense expenditures may be seriously underestimated at the moment and that that is important to get right. To put the matter succinctly the CIA estimates may have been quite good in the early 60's and off by about a factor of 2 by 1975, and therefore Soviet Defense expenditures may be growing much more rapidly then the present revision, which raises the estimate proportionately throughout the entire period, suggests.

The matter obviously is not trivial. If Soviet defense expenditures are growing at twice the rate of the Soviet economy, our interpretation of Russian global political and military objectives would be seriously affected.

I am enclosing a paper which Professor Rosefielde has written, outlining a procedure for getting at this matter. I think it deserves careful attention and objective review. Dr. Rosefielde is in my view the best young Soviet economist around.

On a more personal note you may be interested to know that Dr. Rosefielde will be a visiting professor here next summer, and so your son will have a chance to take some work from him.

Warm regards,

Patrick J. Parker
Professor and Chairman
National Security Affairs

Encl.

Summary

An economic appraisal of the 200% error in the CIA's estimate of Soviet weapons production for 1970 which takes technical progress and qualitative change explicitly into consideration indicates that the source of the Agency's unprecedented error lies in its dollar estimates, and not as officially claimed in its ruble-dollar conversion coefficients. Contrary to the Agency's official claim that its dollar procurement estimates are accurate within 15%, the true figure probably is worse than the typical cost overrun discrepancy observed in the cost-estimation of domestic weapons systems and may well be in the vicinity of 200% (the admitted ruble underestimate of Soviet procurement). If this inference is even approximately correct, it implies that our basic perception of the Soviet defense effort is grossly downward biased.

A reconsideration of the conventional wisdom regarding the probable direction of index number bias in a period of rapid qualitative change reinforces this conclusion. Quality change, it is demonstrated, offsets and may even reverse the usual expectation that dollar estimates understate the Soviet defense effort. Likewise, quality changes intensify the degree to which dollar measures of Soviet defense expenditure growth are understated. If proper allowance is made for these widely unrecognized sources of index number distortion, the Agency's 1976 estimate of Soviet dollar expenditures, $40 billion, should be taken as a lower bound, not an upper bound, and the real rate of Soviet procurement growth should more reasonably be estimated in the 8-10% range than the 5-6% officially reported by the Agency.

Why the CIA's Estimate Of Soviet Defense Procurement Was Off by 200%: The Economic Consequences of Quality Change

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Why the CIA's Estimate Of Soviet Defense Procurement Was Off By 200%: The Economic Consequences of Quality Change

I. Introduction

Few subjects are duller than the analysis of index numbers. Fortunately, under normal circumstances, the strengths and weaknesses of specific indices are sufficiently well understood that the fine points can be safely left to specialists. This paper deals with an exception to this rule.

In 1976 the Central Intelligence Agency revealed that its ruble estimates of Soviet defense expenditures were substantially in error. The revised figure for total Soviet defense spending was 100% greater than previously supposed and 200% greater for procurements (broadly defined including weapons and construction).[1] The basis for this revision was also extraordinary. The new data was obtained by an informant who had transcribed them directly from the records of the Soviet Ministry of Defense.[2] Given these circumstances, one might infer that the quantitative procedures used by the CIA to compute Soviet defense expenditures in rubles were seriously deficient. The Agency however has emphatically denied that this is the case, and has attributed the entire discrepancy to the use of faulty ruble-dollar ratios.[3]

In the analysis that follows we will argue that no scientific evidence has been put forward to substantiate the official explanation (rationalization), and will attempt to show how failure to properly account for technical progress and qualitative change in their dollar estimates could easily explain why the CIA's estimates were so far off the mark. Moreover, to clarify the controversy set off by the revised estimates of Soviet procurement expenditures, an attempt will be made to identify those valuation techniques which most accurately reflect the magnitude and rate of growth

of Soviet procurement in the 1970s. [illegible] developed here requires some understanding of measure theory, we begin with a discussion of the index numbers underlying the CIA's defense calculations.

II. Economic Theory and Index Numbers

An index is a mathematical procedure for measuring and evaluating heterogeneous things. Its meaning depends on the rules of aggregation used in forming the index and theoretical factors thought to govern the behavior of the phenomenon under investigation.[4] In the case of Soviet defense expenditures, especially procurements, the things to be aggregated are weapons and related military material. The main objective in forming a procurement index is to find a set of weights that properly reflect the relative importance of different types of weapons. This could be achieved in principle by discovering the equivalent military worth of alternative weapons, so that if the fire power of a tank were equal to four machine guns, that fact would be accurately conveyed by the index. Economists prefer a different weighting scheme. They desire to know the economic cost of alternative weapons in terms of foregone production opportunities. That is, they wish to employ a set of weights which describe the marginal cost of producing different weapons from the resources made available by contracting one activity in order to expand another. Procurement indices valued in this way allow us to infer that, if the resources used to produce four machine guns costing 1,000 rubles were released, they could be reallocated to the production of a tank costing the same amount.

The equivalent production cost approach has several advantages over indices formed with weights purportedly reflecting combat effectiveness. First, they depend on prices whose meaning is less sensitive to controversial judgments about equivalent military worth under diverse combat

conditions. Second, the economic approach actually subsumes the military equivalence method because, given a fixed budget, Soviet defense planners themselves have to decide the comparative worth of competing weapons systems evaluated at fixed official prices. For a given amount of rubles Soviet military planners can acquire tanks and machine guns in different proportions, the mix actually selected reflecting their overall judgment of relative military worth. Third, since civilian goods and military weapons can be valued according to the same production cost standard, employing price weights permits scholars to assess the sacrifice in civilian consumption incurred for any given level of defense effort.

Although the merit of economic procurement indices ought by now to be widely understood, a great deal of confusion still seems to exist on this subject. Many analysts, failing to appreciate that the Soviet view of equivalent military worth is built into value indices, often mistakenly argue that such indices are only marginally relevant to an adequate evaluation of the Soviet defense effort. On the contrary, because economic procurement indices reflect the terms on which planned civilian and military decisions are made, they constitute a vital measure of the total value of the Soviet defense effort.

Of course, the fact that Soviet tanks and machine guns are properly valued does not establish their comparative military value vis-a-vis their American analogues. Since no market test exists to evaluate the relative merit of Soviet and American weapons, judgments of this sort must be made by military weapons experts. This additional calculation however does not diminish the significance of the ruble measure of Soviet defense expenditure. In order to achieve a realistic scale measure of aggregate Soviet military capabilities, the relative merit of individual weapons must be used in

conjunction with the level of the Soviet military effort to compute the total magnitude of "effective" Soviet effort relative to the American capability. For example, if the share of Soviet GNP devoted to military expenditures were twice ours, and the quality of their weapons were half ours, it could be inferred that the military value of both countries' defense effort were roughly equivalent. If contemporary Soviet weapons were about equal to ours in quality, it follows that their annual procurement is twice our own. Thus it should never be misunderstood that economic procurement indices constitute an indispensible measure of the aggregate magnitude of the Soviet defense effort which, in conjunction with estimates of comparative international weapons quality, allows us to gauge the relative military worth of the aggregate Soviet and American defense programs.

The theoretical significance of economic procurement indices is perhaps obscured for the nonspecialist by a variety of practical problems that arise in the calculation of value indices. Soviet prices more nearly represent average than marginal production costs. Prices change over time and a choice must be made between base and final year price weights. And in the absence of adequate domestic Soviet price data, Soviet weapons are usually valued first in dollars rather than rubles, and only subsequently converted to ruble valueswith the aid of ruble-dollar ratios computed from a small sample of goods where both dollar and ruble prices can be determined.

Although these complications lend some substance to those who argue that economic procurement indices are an ambiguous measure of Soviet defense capabilities, this position is greatly exaggerated. Average cost prices, especially when adjusted for turnover taxes, provide an adequate impression of Soviet production feasibilities, given prevailing institutional constraints. Moreover each particular price set used to value Soviet weapons

can be given a specific behavioral interpretation with the assistance of neoclassical production theory easily summarized as follows:

1. For purposes of static international comparison of American and Soviet procurement, ruble prices understate the relative magnitude of Soviet military expenditure because advanced American weapons, which bulk large in our arsenal, are valued at high Soviet production cost prices. Likewise dollar price comparisons overstate the relative magnitude of Soviet military expenditures because low technology weapons which dominate the Soviet arsenal are valued at high American production cost prices.

2. For purposes of computing rates of military expenditure growth, base year prices overstate the growth rate (Lespeyres indices) and final year prices understate the growth rate (Paasche indices) given the reasonable assumption that prices and quantities are inversely correlated.

Since the CIA only computes input cost procurement indices in dollars (ruble estimates are obtained from the dollar indices with ruble-dollar ratio coefficients), it follows directly that measures of comparative international magnitude overstate the Soviet defense effort. Similarly, because the use of dollar prices affect the procurement index in the same way final year prices do, and because a Paasche dollar price index is employed instead of a Lespeyres index, it follows that CIA estimates of Soviet procurement growth are understated.[5]

These inferences are conventional and appear to be accepted by the CIA.[6] Over the years they have had a strong impact on how the intelligence community has interpreted Soviet defense expenditure data. In particular

officials have not been very disturbed when dollar estimates of Soviet defense expenditures have exceeded US levels, even though the disparity was substantial. Nor have they shown any willingness to seriously question whether their estimates of Soviet procurement growth were significantly in error, in part because index number relatively was not thought to be a very great problem where dollar valued indices were concerned.[7]

III. Index Numbers and the Great CIA Miscalculation

But if all were really under control, how could the procurement estimates in rubles be off by 200%? Three possibilities exist.

1. The CIA has misestimated the number of weapons in the Soviet arsenal.

2. The input costing equations used to value Soviet weapons in dollars were incorrect.

3. The ruble-dollar ratios used to convert dollar values to rubles were only one third the real order of magnitude.

All three factors of course could be partially responsible for the discrepancy. For reasons the author does not understand, most experts seem to agree that the Soviets have been unable to conceal significant numbers of rockets, planes (in underground storage areas), tanks, etc. from the American satellite detection system. Accepting expert opinion, this leaves only two alternatives with very different implications.

On one hand, the input cost equations used to obtain the dollar value of Soviet weapons may be defective. If this were the case, it would mean that American intelligence estimates of Soviet defense expenditures would be grossly misleading, since both our dollar and ruble calculations would be wrong. On the other hand, the dollar values might be accurate, but the

ruble-dollar ratios used to convert dollar to ruble estimates could be at fault. In this instance the dollar estimates and the conventional interpretation placed on them remain as before, and the disease is isolated to the infected ruble values. The only novel effect of such a revision would be to double the defense share of Soviet GNP (including manpower) to 11%-13%.[8]

Since the spector of the first alternative threatens the overall credibility of American estimates of Soviet defense expenditures, the CIA rather unastonishingly has embraced the faulty ruble-dollar ratio explanation of the discrepancy between the facts and their past estimates.[9] The argument put forward is disarmingly simple. The Agency had mistakenly supposed that production costs were falling more quickly in the defense sector than in the civilian sector generally. This interpretation seemed plausible because it was consistent with the fact that the published Soviet defense budget remained relatively constant while procurements rose. In other words the arithmetic checked.

New evidence however, it is claimed, suggests that the defense sector really was not more efficient than the civilian sector (the arithmetic no longer checked since the true Soviet defense budget turned out to be many times greater than the published figures), and the higher ruble-dollar ratios conveniently permit accounts to be balanced again.

Even ignoring the low scientific credibility of arithmetic as opposed to statistical confirmation, the ruble-dollar ratio argument put forward by the Agency is suspect because the CIA does not know how much capital and labor are allocated to defense production in the USSR and therefore could not possibly have made their efficiency determination on acceptable econometric grounds. What little evidence exists in this regard is equivocal.

On one hand input-output data derived from Soviet sources indicate that average factor productivity in military machine building for the year 1966 was not very different from civilian machine building.[10] This implies that ruble-dollar ratios may well have been underestimated. However, an elaborate sectoral CES production function study of postwar Soviet industrial output showed that the machine building sector is the most efficient sector in the Soviet economy and that the efficiency advantage of machine building has grown steadily.[11] This suggests that the ruble-dollar ratio of military machine building could well have been falling relative to the economywide average as the Agency had formerly surmised.

Given the equivocal nature of the evidence, which the Agency did not have in its possession anyway, the ruble-dollar explanation must be interpreted more as a rationalization than as a serious scientific model because no mechanism has been put forward by which putative but erroneous facts could be falsified. This of course is not to say that the past ruble-dollar estimates were not too low. They probably were.[12] But were they low enough (compared with the real values, not the Agency estimates) to account for the discrepancy between past and present intelligence estimates? While no definite answer can be given to this question, it is easily seen that the Agency has provided no scientific evidence to sustain such a conjecture. As a consequence, it must be inferred that the discrepancy remains an open issue, or to put the matter more forcefully, that current dollar estimates of Soviet defense expenditure may be drastically too low.

IV. Technical Progress, Quality Change and the Costing of Soviet Defense Expenditures

A plausible case supporting the argument that erroneous dollar estimates of Soviet procurement may be the real source of the discrepancy between the

old and new ruble estimates can be constructed by focusing attention on the issue of technical progress and quality change.[13] How do CIA input cost indices of Soviet procurement take account of technical progress in the form of new weapons, and quality change expressed by improved characteristics of traditional weapons? An exact answer to this question would require an exhaustive analysis of the costing equations themselves to ascertain how thoroughly they were updated and the principles that were applied in the adjustment process. Since the author has for understandable reasons been unable to directly appraise the costing equations, our analysis must be confined to the conceptual problem of valuing weapons systems in a period of rapid technical progress.

Although details of the CIA methodology for computing Soviet defense expenditures are highly classified, the basic concept is public knowledge. The Agency collects data on countable weapons, tries as best it can to discover the technical specifications of these weapons which are then sent to American defense contractors for cost estimates that serve as prices in aggregating total Soviet procurement. If the Soviets were kind enough to cooperate with the American intelligence effort by sending detailed blueprints of all their weapons to the appropriate American authorities in a timely way, and these blueprints were costed annually at current prices, the established method would be accurate and would necessarily incorporate Soviet technical progress and quality change. Comparisons of the US and Soviet defense efforts in current dollars would still overstate the magnitude of Soviet expenditures, but this would be the expected theoretical outcome and therefore would pose no difficulties.[14]

Official costing practice however inevitably deviates from the ideal. First, assuming that the weapons count is correct, American defense analysts

still do not know the technical specifications of most Soviet procurement. This is especially true for new and improved weapons which have not fallen into our hands. As a consequence, cost estimators are compelled either to use old weapons whose characteristics may be better known, civilian analogues such as tractors, or even vintage American weapons as their costing standard. Adjustments for hypothetical improvements may be quite arbitrary or may not be made at all. For example, it is very difficult just looking at a Soviet ship, plane, missile or tank to ascertain the number of improved subsystems it may contain. Undetected but important qualitative improvement therefore may well be a source of considerable costing undervaluation.

Second, it is often uneconomical to have modified weapons completely recosted by civilian defense contractors. Factors are therefore established for adjusting prior estimates in the light of changes in a variety of technical characteristics. This approach, if carried on for long periods, leads to outmoded cost equations which no longer correctly reflect American costs, and which may ignore production complementarities that make the cost of the modified weapon deviate from a linear sum of their component parts.

Third, even when subsystems are detected or new weapons appraised, it is very difficult to ascertain precise performance characteristics. Small changes in performance capabilities however may have disproportionately large cost effects suggesting further how rapid Soviet technical progress and quality change could if inexactly perceived cause our dollar estimates of Soviet procurements to be understated.

This inventory of costing deficiencies makes it plain that even without considering index number bias there is ample reason for suspecting that technical progress and quality change may have contributed to the discrepancy in the CIA ruble estimates of Soviet procurement. An explicit appraisal of index bias reinforces this impression.

V. Technical Progress, Quality Change and Index Number Bias in Dollar Estimates of Soviet Procurement

Perhaps the classic inference drawn from index number theory regarding Soviet defense expenditures is that dollar estimates overstate the comparative value of Soviet armaments. If Soviet procurement plus construction in 1976 as reported by the CIA is $40 billion, dollar estimate bias suggests that the true value is below this and probably lies much closer to the $20 billion the US spends on the same items. When technical progress and quality change are taken into consideration however this inference may no longer be valid, and may even be reversed.

Proposition 1: As the technological level of Soviet weapons rise, the size of the dollar estimate bias must decline.

Proof: The dollar estimate bias is based on the assumption that the price of conventional weapons is relatively high in the US, and that the share of conventional weapons in the Soviet arsenal is relatively large. Even if Soviet prices remained unchanged, the distortionary effect of high conventional weapons prices must be reduced as the composition of Soviet weapons divided between advanced and conventional weapons comes more and more to approximate the US mix. Moreover, if as is likely, relative Soviet prices on average approach US relatives as the weapons mix changes, then the bias must diminish further. As to the possibility of bias reversal, all that would be required is that the share of advanced weapons in the Soviet arsenal exceed that of the US, while the relative price of advanced armament remained lower in the US because America was further down its advanced technology learning curve. Under these circumstances, an index

for which the Soviet-calculated weapon prices used to weight the relatively abundant supply of advanced weapons would yield a higher index value than if American price weights were employed. This reversal of the traditional direction of the bias is due to the fact that prices and quantities would be directly instead of indirectly correlated.[15]

Under present circumstances where the share of advanced Soviet weapons is rising and their average quality is converging towards ours, it is becoming progressively misleading to insist that the dollar bias significantly overstates the Soviet defense effort.[16]

Another hoary artifact of index theory is the inference that the rate of Soviet procurement growth evaluated in dollars is downward biased. Proper account of quality change does not reverse this effect, but it does intensify the magnitude of the downward bias.

Proposition 2: Quality adjusted dollar indices necessarily impart a downward bias to the effect of qualitative improvement in Soviet weapons.

Proof: To form an index new and improved weapons must be expressed in terms of a numerically equivalent amount of their base year counterparts. Equivalence is determined by the marginal rate of prevailing product transformation between the old and the improved weapon. Since new technologies will lie higher on the Soviet learning curve than the American, dollar prices of advanced Soviet weapons will understate domestic Soviet production costs and thereby understate the change in Soviet production potential represented by the introduction of advanced armaments. This underestimate of the growth increment imputable to qualitative improvement is

compounded by the overestimate of the magnitude of Soviet defense expenditures attributable to the dollar bias in the base year when Soviet armaments were substantially inferior to our own. The combined effect of understated increments and overstated base year defense expenditures necessarily biases our perception of Soviet qualitative weapons change downward.[17]

Proposition 3: The understatement of the qualitative improvement of Soviet weapons is further biased by the CIA method of price deflation.

Proof: To eliminate the effect of inflation a Lespeyres price index with base year quantity weights is used to deflate a value index of current procurement producing a Paasche quantity index with final year price weights. Since Paasche indices except in extraordinary circumstances understate growth by overstating the base, it follows directly that American dollar cost estimates using final year price weights bias Soviet defense expenditures even further below the levels acknowledged conventionally.[18]

Propositions 1, 2 and 3 taken together with the deficiencies of the direct costing method regarding technical progress and qualitative change demonstrate that the reliability and conventional interpretation of dollar estimates of Soviet procurement are hardly sacrosanct. A great deal depends on how effectively technical progress and qualitative change are handled in measuring the Soviet defense effort, and in the absence of concrete evidence that the problem is adequately understood by American authorities, it is difficult to accept the Agency's claim that "On balance, we believe that the overall dollar cost estimate for Soviet defense activities is unlikely to be in error by more than 15 percent."[19]

VI. The Real Magnitude and Rate of Soviet Postwar Procurement Growth: A Geometric Interpretation

Attention thus far has been focused on dollar estimates of Soviet defense expenditures because they are the only independent defense statistics officially published by the American intelligence community. Official ruble estimates are computed derivatively with the aid of ruble-dollar ratios. Until recently it was generally assumed that these derivative estimates provided a reliable ruble profile of Soviet defense expenditures, but this is no longer tenable. The only ruble figures we know with any certainty are those obtained for 1970 through covert intelligence. This is particularly unfortunate because the ruble values undoubtedly would convey a superior picture of the change in production potential that has accompanied the rapid growth of Soviet defense expenditures.

An impression of how these rubles estimates might diverge from available dollar calculations however can be achieved by applying the conventional geometry of index number analysis. Diagram 1 presents a series of points which indicate how the dollar observations probably deviate from true measures of Soviet production potential.

In 1950 conventional weapons q_1 constituted the preponderant share of the output mix, ν_{1950}. By 1977 the composition of Soviet weapons represented in American costing equations changed with both the share and absolute quantity of advanced armaments q_2 increasing compared with conventional procurement. However because of the deficiencies of the costing procedure point B understates the real magnitude of Soviet defense expenditures. Many weapons and weapons subsystems which have benefited from technical progress and quality improvement are simply not reflected in the costing equations. Geometrically the true situation can be expressed by the re-classification of some weapons from the conventional to the advanced

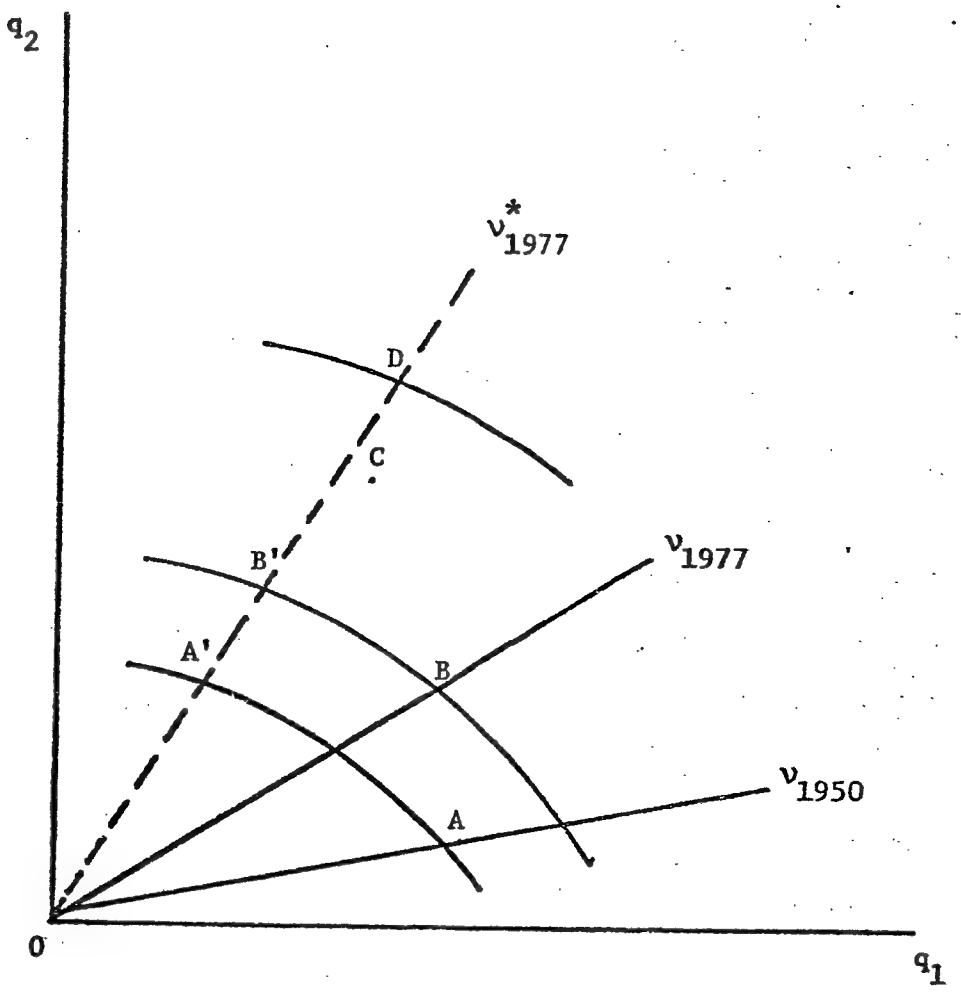

Diagram 1

category (a horizon shift to the left) and an increase in the number of advanced weapons and weapon subsystems (a vertical shift). Point C therefore represents the quantity and composition of Soviet procurement adjusted for omitted technical progress and quality improvement. However point C itself understates the real change in production if as in our example improved weapons are converted into old weapon equivalents with American prices which according to index theory place a lower relative value on advanced weapons. Replacing American prices weights with Soviet price weights for the commensuration of old and new weapons therefore necessarily increases the numerical quantity both of advanced and conventional quality improved weapons. This additional adjustment is represented by point D in Diagram 1. The distance B'D/OD indicates the degree to which the American costing equations and quality adjustment procedures understate the real change in Soviet procurement production potential. According to the existing measure standard Soviet weapons production potential has risen OB'/OA', while the real change is actually OD/OA'.

Although the understatement of both the level and rate of change in Soviet production may be quite serious as illustrated in Diagram 1, index number distortion further exacerbates matters. This is shown in Diagram 2 which can be used to depict two alternative index measures of postwar Soviet procurement growth, one with 1977 American price weights (α 1977), the other with 1950 Soviet price weights (ρ 1950), both using official American estimates of Soviet procurement in 1950 and 1977 (points A and B). The choice of 1977 American prices reflects existing practice, the selection of 1950 Soviet ruble weights the fact first demonstrated by Moorsteen that a Lespeyres index most accurately characterizes the change in an economy's production potential during periods of rapid structural transformation.[20]

The Effect of Quality Change and Technical Progress
On Observed Index Bias in the Measurement
Of Soviet Defense Expenditures

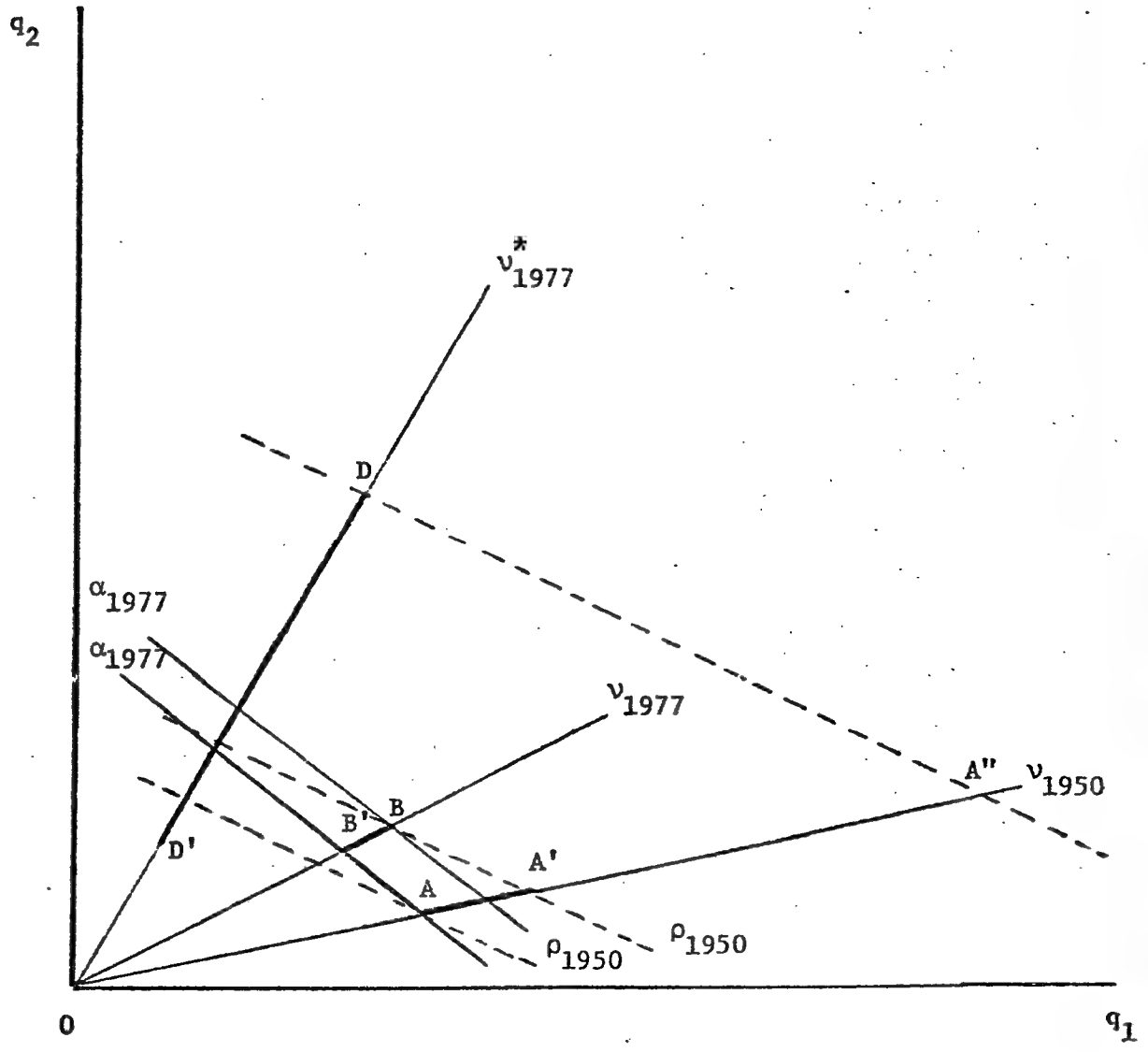

Diagram 2

As can be easily observed the use of American price weights indicates that production potential has increased OB/OB', compared with the much larger change OA/OA', obtained with Soviet base year price weights. Neither measure however approximates the real change in Soviet production potential OD/OD'. To obtain a measure of growth commensurate with the real change, Soviet base year prices would have to be applied not to the official US weapons count, but to the true quality adjusted procurement quantity at point D. This yields the estimate OA"/OA, which is similar to OD/OD'.

For those unfamiliar with index number analysis these distinctions may be somewhat perplexing. The important points to note though are quite straightforward. First, the downward bias introduced into the measurement of Soviet procurement by the use of final year American prices to adjust for technical progress and quality change is compounded when American price weights are employed to compute a Paasche index of Soviet procurement growth. Second, a Lespeyres index calculated with Soviet prices produces a much greater rate of weapons growth, but the true magnitude of the change in Soviet procurement potential can only be determined if Soviet prices replace American prices in adjusting armaments for quality improvement, and all sources of ommitted technical progress are properly accounted for.

VII. The Deficiency of Dollar Cost Estimates of Soviet Defense Expenditures and the Great CIA Miscalculation

Agency spokesmen in their writing and testimony affect a studied languague which invites knowledgeable professionals in other walks of life to have confidence in the thoroughness and accuracy of their work.[21] Those unfamiliar with the enormous difficulties involved in measuring

Soviet defense expenditures given the fragmentary data at hand are often lulled, as the Agency perhaps itself is lulled into believing that dollar estimates of Soviet defense spending are accurate within 15%, or more preposterously still, that "procurement of weapons and equipment and construction" are the most reliable components of the entire estimate.[22] When it is recalled that American defense contractors with the best available information are lucky to cost their own weapons systems within 100%, the foolishness of pretending that Soviet procurement can be estimated within a margin of error substantially less than 15% should be manifest to all objective analysts.

One might have supposed that the Agency's exaggerated sense of its own infallibility (within 15%) would have been diminished by the fact that its ruble procurement calculations (derived from dollar estimates) were inaccurate in excess of 200%. The claim of a 15% accuracy margin however was made more than a year after the true facts about Soviet procurement expenditures came to light.

The analysis developed in this paper suggests that the Agency's confidence in its dollar estimates is probably misplaced. The difficulties of dollar cost estimating in a period of rapid technological progress, combined with the systematic index number biases associated with quality change, appear likely to have been the primary factors contributing to the great discrepancy between the facts and the Agency's former ruble estimate of Soviet defense expenditures.

Without direct access to the dollar costing equations, it cannot be contended of course that the case for quality improvement as the primary cause of the Agency's great miscalculation has been empirically confirmed. The burden of proof however now rests with the Agency which has access to

the data, but which up to the present offers no explanation at all for the discrepancy other than the analytically unsubstantiated claim that the ruble costs of high technology items were greater than previously thought, in exactly the right proportion to make the Agency's arithmetic tally. The strong possibility that dollar estimates of Soviet defense expenditure are significantly understated is a very serious matter. Since this paper has shown precisely how and why our dollar estimates may well be significantly understated, a close rethinking of Western defense perceptions is clearly in order.

VII. Conclusion

The discovery of a 200% error in the ruble estimate of Soviet procurement for 1970 has called into question the adequacy of the dollar cost estimates of Soviet defense expenditure from which the ruble estimates themselves were derived. An analysis of the costing methodology used to compute dollar estimates revealed many potential deficiencies which could easily account for a large portion of the ruble procurement discrepancy. The deficiencies it was shown moreover are compounded by the substantial downward index number bias associated with measuring rates of growth in dollars. Although the author does not have access to the costing equations, he has been told by sources he considers reliable that they are grossly inadequate and have not been systematically updated. This raises the following possibilities:

1. Dollar estimates of current Soviet procurement no longer significantly overstate and may even understate Soviet weapons production.

2. Dollar estimates of Soviet procurement are understated by the omission and undervaluation of qualitative improvements in Soviet weaponry.

3. Dollar measures of Soviet procurement growth are not only understated for the usual reasons, they are seriously understated because of the additional influence of technical progress and qualitative change.

More specifically,

1. The 40 billion dollar CIA estimate of Soviet procurement and construction for 1976 should not be discounted for the purported upward bias in dollar estimates.

2. The figure of 40 billion dollars may significantly understate the real, quality adjusted level of Soviet weapons production.

3. The quality adjusted dollar rate of Soviet procurement growth may be considerably in excess of the 5-6% unadjusted rate currently being estimated.

4. The quality adjusted rate of procurement growth could easily be in the range of 8-10%.

Needless to say these conclusions are conjectural. It cannot be too strongly emphasized however that the analysis developed in this paper is testable. A major review and evaluation of the dollar cost estimating equations with special attention paid to the problem of qualitative change would go a long way towards verifying or falsifying the contention that the discrepancy in the ruble estimates lies in the underestimation of the dollar estimates of Soviet procurement, not in faulty ruble-dollar ratios as the CIA contends.

Likewise a study of ruble price trends could be used to assess whether the index phenomena suggested above are likely to be observed in practice. Although enough ruble price data does not exist to allow the dollar procurement indices to be recomputed in rubles, by aggregating weapons into major components, available ruble data could shed significant light on the comparative behavioral properties of dollar and ruble indices. However these studies turn out, they should help clarify the source of the great discrepancy between the old and new CIA ruble procurement estimates.

Notes

1. Estimated Soviet Defense Spending in Rubles, 1970-75 (1976), p. 1. "The new estimate is about twice the previous estimate of total ruble spending for defense in 1975." The term procurement is used here in a broad sense to encompass all nonmanpower expenditures including weapons, construction, RDT & E and maintenance. The increase in this factor is inferred from information provided in the Agency's document which asserts that 20% of Soviet defense expenditures are devoted to manpower, or 10 billion rubles in 1970 (pp. 1 and 13). Since almost all of the upward valuation is attributable to nonmanpower, the lower limit of the increase in the nonmanpower estimates can be computed as follows:

$$1) \quad \alpha x + y = 25$$
$$\alpha 40 = 25 - 10$$
$$\alpha = 2.67$$

where x represents nonmanpower expenditures in 1975,
y represents manpower expenditures in 1975,
α is the coefficient by which nonmanpower expenditures must be increased for the terms on the lefthand side of equation 1 to equal 1/2 of the 1975 Soviet defense expenditure estimate, $50 billion.

Since there is some ambiguity in the CIA explanation of how the error was distributed, in this paper we use and estimate 200% as the lower limit of the procurement error instead of 267% obtained from equation 1. For a more detailed discussion of the inadequacy of the CIA ruble data see Lee (1977b).

2. "Assessing the Soviet Economy: The CIA's Giant Goof," p. 97; Allocation of Resources in the Soviet Union and China - 1976, p. 82. Joseph Alsop (1977).

3. The revised ruble estimates do not affect the Agency's "appraisal of the size or capabilities of Soviet military forces," or ..."the dollar cost of reproducing Soviet defense programs in the U.S.," because "...the changes are largely the result of estimates of higher ruble prices rather than discovery of larger programs." Quoted from Estimated Soviet Defense Spending in Rubles, 1970-75 (1976), pp. 1-2. See also Allocation of Resources in the Soviet Union and China - 1976 (1976), pp. 14-20. The testimony is by George Bush.

4. These simple strictures underlie what can best be described as the economic approach to index number theory. For a thorough discussion of its relative advantages see Paul Samuelson and Subramanian Swamy (1974), Abram Bergson (1961, 1975), Moorsteen (1961), Nutter (1966) and Rosefielde (1975).

The economic approach to index number theory however is assailable if the factors underlying the theoretical analysis differ from what they are supposed to be. In this paper we assume that the economic approach

is applicable for the interpretation of Soviet production behavior. For an alternative view which can be traced to Walsh, Jevons, Lespeyres, Paasche, Sauerbeck, Edgeworth and Irving Fisher see Yrjö Vartia (1976a, 1976b) and Irving Fisher (1922).

5. Daniel Yergin has recently suggested that ruble indices of Soviet defense expenditures are suppressed by the intelligence community because they would exaggerate the size of the American defense effort and thereby diminish the force of the "arms coalition's" case for increased defense spending. Even ignoring the argument developed in this paper that the index bias supposed by Yergin is no longer important, he ignores the fact that ruble estimates greatly increase the growth rate of Soviet defense expenditures which presumably would buttress the "arms coalition's" case. I agree however with his assertion that ruble indices should be computed and published. See Daniel Yergin (1977), p. 73.

6. See for example, A Dollar Cost Comparison of Soviet and US Defense Activities, 1966-76 (1977), p. 4. I have not however been able to determine whether the Agency believes that ruble rates of procurement growth derived from dollar estimates through a ruble-dollar ratio conversion behave like a ruble valued procurement index. If growth is measured in constant rubles (i.e. ruble-dollar ratios), the dollar and ruble growth rates computed by the Agency should be identical since the base and the increments of the ruble estimate are merely scalar transforms of the dollar estimates. The true ruble index however will exhibit a higher rate of growth.

7. "On balance, we believe that the overall dollar cost estimates for Soviet defense activities is unlikely to be in error by more than 15 percent. This judgment, while informed, is nonetheless subjective and not the result of statistical measurement." See A Dollar Cost Comparison of Soviet and US Defense Activities, 1966-76 (1977), p. 3.

8. Estimated Soviet Defense Spending in Rubles, 1970-75 (1976), p. 2. The real figure for 1975 is probably closer to 15% because the CIA still insists on using dollar rates of Soviet defense spending growth to compute the ruble burden. Since the only valid ruble number the CIA possesses is for the year 1970, if the 40-45 billion figure were projected at a rate of 8-10% instead of 4-5%, the Agency's 1975 estimate would rise to 59-72, instead of 50-55, making the burden 13-17% For a similar view derived from other methods see William T. Lee (1977a).

9. Less ungenerous interpretations can also be placed on the CIA's preference for the faulty ruble-dollar ratio explanation. Since the covert source of the new ruble defense estimates did not become public knowledge until long after the Agency released its report, the CIA may merely have been protecting its sources. Now that the real story is out however, I am unaware that the Agency has revised its original explanation.

10. The exact figures are:

Table N1

Capital-Output and Labor Output Ratios
Computed in 1966 Adjusted Factor Costs
On a Sector of Delivery Basis
(Assuming at 12% Rate of Return on Capital)

	Capital/Output	Labor/Output
Agriculture	1.3271	.4590
Construction	1.3852	.3874
Trade	1.4706	.4204
Civilian Machinery	1.5783	.2605
Food	1.5896	.4379
Light	1.6261	.3355
Construction Materials	1.8492	.3017
Military Machinery	1.8700	.2743
Chemicals	1.9938	.2010
Metals	2.3148	.1892
Transportation and Communication	2.5128	.2278
Fuels	3.0540	.1583

Capital/Output measured in rubles per unit of output.
Labor/Output measured in man years per unit of output.

They were computed by the author from data published in Vladimir Treml (1972).

11. Steven Rosefielde (1977, 1978).

12. William T. Lee (1977b), p. 15. For a detailed discussion of ruble-dollar methodology and their reliability see Vladimir Treml and Dimitri Gallik (1973).

13. A rapidly growing literature exists on how to treat technical progress and quality change with index methods. Most of the material on "hedonic" indices however requires market price determination and is not applicable for present purposes. See Franklin Fisher and Karl Shell (1972), Zvi Griliches, ed. (1971), Zvi Griliches and Dale Jorgenson (1967, 1971). For a more conventional treatment of quality see Edward Denison (1957). Note also that the term technical progress used in this paper refers to new types of weapons and not to increased factor productivity. Technical progress in the sense of improved factor productivity does not apply here because we do not explicitly analyze the relationship between factor productivity and relative production cost.

14. It will be demonstrated shortly however that even under these ideal circumstances Soviet technical progress and quality change will be biased downward when procurement growth is measured in dollars.

15. The exact point where a positive dollar bias becomes a negative dollar bias depends on the price ratios in America and the Soviet Union. For example suppose that the ratio of conventional to advanced weapons prices in the US and the USSR were respectively

$$2) \quad p_{ia}/p_{ja} = 2/1; \qquad p_{ir}/p_{jr} = 1/4 \quad .$$

The dollar weighted index, I_a, would exceed, equal or understate the ruble weighted index, I_r, depending on the conventional-advanced weapon ratio, q_{ir}/q_{jr}, in the index expressions below.

$$2a) \quad I_a \gtreqless I_r$$

$$2b) \quad p_{ia}q_{ir} + p_{ja}q_{jr} \gtreqless p_{ir}q_{ir} + p_{jr}q_{jr}$$

$$2c) \quad 2q_{ir} + q_{jr} \gtreqless q_{ir} + 4q_{jr}$$

If $q_{ir}/q_{jr} \geq 3:1$, then $I_a \geq I_r$.

If $q_{ir}/q_{jr} < 3:1$, then $I_a < I_r$.

Since for any set of ratios $p_{ia}/p_{ja} = n/1$, $p_{ir}/p_{jr} = 1/m$ bias is a monotomic function of the quantity ratio, q_{ir}/q_{jr} a point of index neutrality will always exist. In the example above, if the American conventional-advanced weapons ratio q_{ia}/q_{ja} were 1:1, index number bias reversal would occur long before the Soviet and American weapons mix converged. For less divergent price ratios, index number bias reversal would be deferred until the US-USSR arsenals were more alike. It should however be clear that as the Soviets have modernized their weapons systems, the standard assumptions concerning index number bias have become progressively more tenuous.

16. For an econometric analysis of the rate of aggregate technical progress in the Soviet Union see Desai (1976), Gomulka (1976), Rosefielde and Lovell (1977) and Weitzman (1970). On sectoral productivity see Rosefielde (1977, 1978). For a study of the quality of Soviet output see Spechler (1970, 1975). On the general issue of technology in the USSR see Berliner (1976), Granick (1975). An impression of the pace of improvement in Soviet arms can be effectively obtained from Lee (1978), Luttwak (1977), Nitze (1977), Parker (1978), Pipes (1977), Polmar (1977) and Wohlstetter (1977). More technical evaluations appear in Parker (1978).

In appraising the welter of evidence supporting the view that the Soviets have achieved rapid technical progress and qualitative advance in the production of civilian and military goods, it should be recognized that the index number analysis carried out here depends only on absolute technical progress, not technical progress relative to the US.

17. From note 15 we know that $I_a > I_r$ if the composition of Soviet weapons q_{ir}/q_{jr} is somewhat greater than the US mix, and $p_{ia}/p_{ja} > p_{ir}/p_{jr}$. To transform improved weapons into their base year analogues, old weapons are multiplied by prices representing prevailing marginal rates of transformation:

$$1) \quad q^*_{jr} = p^*_j/p_j \; q_{jr}$$

where the asterisk signifies the new model. Since America is undoubtedly further along its technology learning curve, the quality improved weapon q^*_{jr} will probably be relatively cheaper in dollar than ruble prices so that

$$2) \quad p^*_{ja}/p_{ja} \; q_{jr} < p^*_{jr}/p_{jr} \; q_{jr}$$

and therefore the dollar quality improved growth index must understate both the ruble adjusted growth index where all other goods are weighted in dollars and the pure ruble adjusted index.

$$3) \quad \frac{p^*_{ja}/p_{ja} \; dq_{jr}}{I_a} < \frac{p^*_{jr}/p_{jr} \; dq_{jr}}{I_a} < \frac{p^*_{jr}/p_{jr} \; dq_{jr}}{I_r}$$

18. Consider a simple two good index valued in money prices. The money price level in the base year is 1 and n in the final year. Assume moreover that relative prices also change between the two periods. Measured in current values growth is

$$1) \quad I_c = \mu p_{11}q_{11} + \mu p_{12}q_{12}/p_{01}q_{01} + p_{02}q_{02}$$

where the first subscript indicates the year, the second the product.

To adjust for money inflation I_c must be deflated with a price index, conventionally with base year quantity weights

$$2) \quad I_p = p_{11}q_{01} + p_{12}p_{02}/p_{01}q_{01} + p_{02}q_{02}$$

which yields a Paasche quantity index with final year price weights

$$3) \quad I_q = I_c/I_p$$

$$= p_{11}q_{11} + p_{12}q_{12}/p_{11}q_{01} + p_{12}q_{02}$$

$$= p_1q_1/p_1q_0 \; .$$

19. See note 7.

20. Moorsteen (1961).

21. Allocation of Resources in the Soviet Union and China - 1976 (1976), pp. 17-20.

22. A Dollar Cost Comparison of Soviet and US Defense Activities, 1966-1976 (1977), p. 2.

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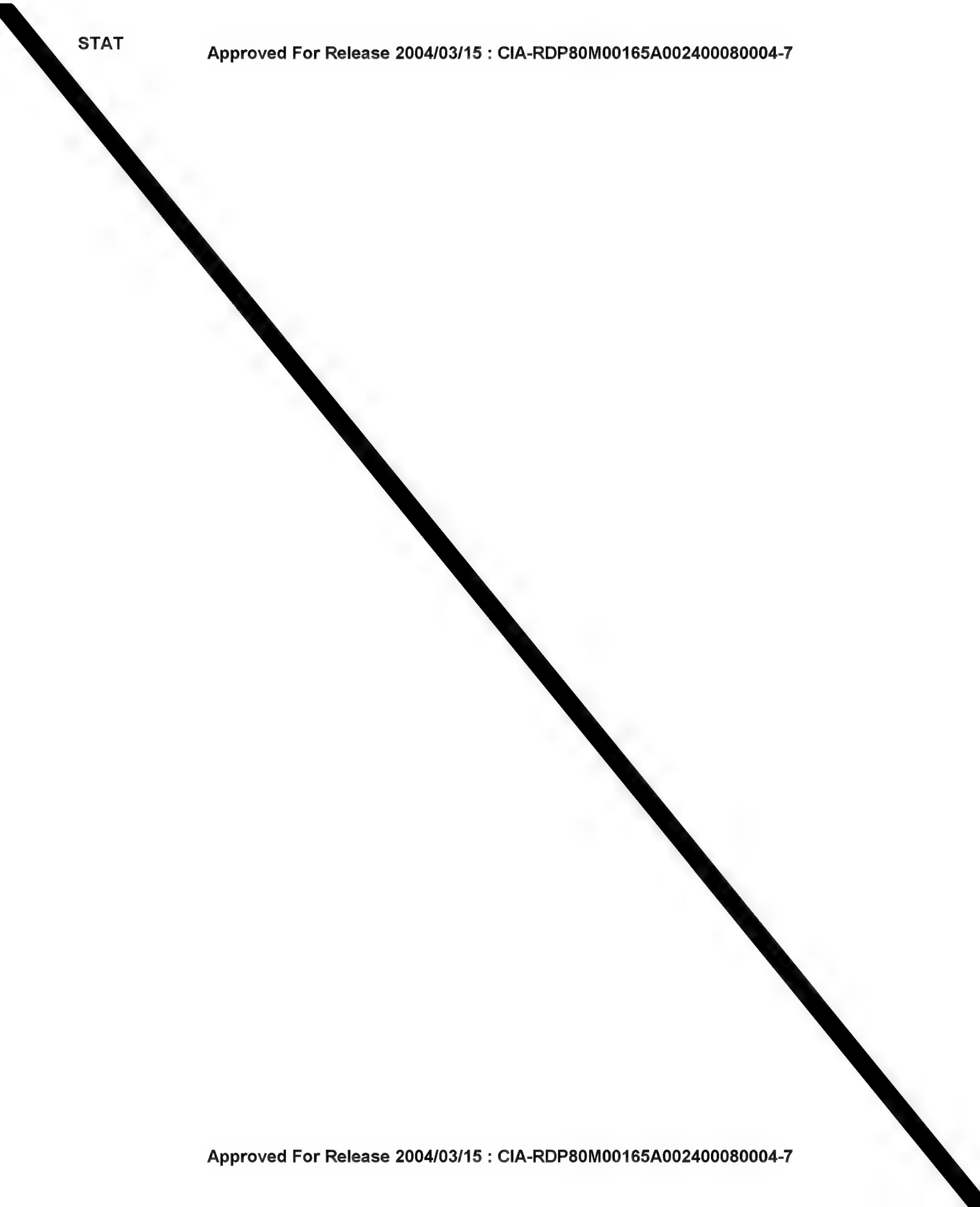

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ILLEGIB

MEMORANDUM FOR: Director of Central Intelligence

FROM : [redacted] STA

SUBJECT : Schick Lecture sent by Zumwalt

1. Lecture on inter-relationships between energy policy and national security; given at the NWC 19 October 1976.

2. Content is thin and ideas not well developed. However, there are some interesting statistics and the point that the use of energy supplies as leverage in international politics, thereby increasing non-military options, is a good one.

3. Schick says:

° Because of increasing oil dependency, OPEC's prices are a "weapon" the U.S. cannot avoid.

° US-USSR conventional balance is affected by U.S. domestic energy balance which is partially derived from world energy balance.

° Oil SLOC's are weak points for both U.S. and USSR (USSR to be net importer by 1985).

° One billion barrel petroleum reserve by 1985 will reduce problem.

4. Recommend:

° Sign attached thank you note to Zumwalt.

° Send to OER to add to background material. OK [illegible] 18 Jul 76

Very respectfully,

[redacted] STA

Attachment

INTERRELATIONSHIPS BETWEEN ENERGY POLICY AND NATIONAL SECURITY

GUEST LECTURE DELIVERED BY

JACK M. SCHICK
ACTING DIRECTOR
OFFICE OF GOVERNMENTS AND ENERGY
INTERNATIONAL ENERGY AFFAIRS
FEDERAL ENERGY ADMINISTRATION

AT THE

UNITED STATES NAVAL WAR COLLEGE

19 OCTOBER 1976

Approved For Release 2004/03/15 : CIA-RDP80M00165A002400080004-7

ER

ADMIRAL STANSFIELD TURNER

18 JUL 1977

Dear Bud,

Just a note to thank you for sending Jack Schick's lecture. The whole energy question is being looked at by the Intelligence Community from several points of view - Schick makes some good points, particularly the effect of energy as leverage in international politics increasing non-military options.

Thanks again.

Sincerely,

STANSFIELD TURNER

Admiral E.R. Zumwalt, Jr. (Ret.)
1500 Wilson Boulevard
Suite 1700
Arlington, Virginia 22209

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Office of the Director
Central Intelligence Agency

Executive Registry
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11 November 1977

Dear Mr. Roboff:

Your 9 November letter inquiring about restrictions on the use or shipments of cesium, cesium compounds and pollucite ore was referred to this office for a response. Your question is outside the purview of this Agency and I can only suggest that you again pursue the matter with the Department of Commerce.

I regret that we can not be more helpful.

Sincerely,

/s/

[redacted]
Deputy Executive Secretary

Mr. Stanley B. Roboff
Director, Corporate Development
Kawecki Berylco Industries, Inc.
220 East 42nd Street
New York, New York 10017

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November 9, 1977

Admiral Stansfield Turner
Director, Central Intelligence Agency
McLean, Virginia 22101

Dear Admiral Turner:

Certain recent events regarding shipments of the commercial cesium ore, pollucite, have raised questions which may have a bearing on a growing part of our business and on the availability of cesium ores in the U.S. and overseas.

By way of explanation, KBI is a New York Stock Exchange listed company, and is probably the leading producer and supplier in the U.S. of high technology materials. Among the materials in which we are interested is pollucite ore, a cesium raw material from the Tanco Mining properties, located at Bernic Lake in Manitoba, Canada. KBI owns approximately 25 percent of Tanco.

Pollucite can be employed as a raw material for a key ionizing agent (cesium) in the magnetrohydrodynamic (MHD) system for producing power directly from coal or other fossil fuels. Until quite recently Tanco had been selling pollucite ore overseas, ostensibly for use in MHD systems in the U.S.S.R. Since there is nothing that we know of that is classified about MHD in the U.S., Canada or the U.S.S.R., overseas shipments of pollucite were permitted by the Canadian Government.

Within the past year, however, the Government of Canada has refused to allow shipments of pollucite from Canada to Europe, where the known customer is the U.S.S.R. Inquiries which Tanco and KBI have made to Canadian and U.S. Government agencies have brought no explanation, except that the U.S. Department of Commerce has indicated that there are no restrictions, other than the usual license procedure, in shipping pollucite and cesium metals and compounds overseas.

continued.....

Nevertheless, with requirements for pollucite derived materials growing throughout the world with some vigor, and with our Company (and Tanco) faced with upcoming investment and marketing decisions, it is important for us to know whether pollucite will be subject to governmental restrictions because of potential consequences to which we are not privy.

My purpose in writing, therefore, is to ask if there are any restrictions, current or planned, on the use or shipments of cesium, cesium compounds and pollucite ore, and if so, why. This information will be of importance to us, since it will help guide near term planning for an important segment of our business.

Sincerely,

Stanley B. Roboff
Director, Corporate Development

SBR:fg
Enclosure: KBI Product List

P.S. While we have had little experience obtaining information under the "Freedom of Information Act," if our requested information must be provided under that Act, then please consider this as a request within the provisions of the Freedom of Information Act.

SBR

PRODUCT DIRECTORY

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BERYLLIUM
BEAD	BLOCK	WIRE
FLAKE	ROD, BAR, TUBE	EXTRUSIONS
INGOT	SHEET, FOIL	MACHINE BLANKS
POWDER	PLATE	FABRICATED FORMS

CONSOLIDATING METHODS
1. HOT PRESSING
2. ISOSTATIC PRESSING (cold and hot)
3. PLASMA SPRAYING

BERYLLIUM ALUMINUM (Lockalloy)
ROD, BAR, TUBE	SHEET, FOIL	EXTRUSIONS
FABRICATED FORMS	PLATE	

BERYLLIUM COPPER
INGOT	ROD, BAR	EXTRUSIONS
STRIP	TUBE, WIRE	PLATE
BILLET	FORGINGS	CASTINGS

FABRICATED FORMS

BERYLLIUM CUPRO NICKEL
INGOT	ROD, BAR, TUBE	CASTINGS
STRIP	FORGINGS	FABRICATED FORMS

BERYLLIUM NICKEL
INGOT	STRIP	WIRE
ROD	BAR	CASTINGS

BERYLLIUM TITANIUM
ROD, BAR, TUBE	SHEET	EXTRUSIONS
FABRICATED FORMS		

BISMUTH*
INGOT, SHOT, POWDER, PELLETS

BORON
AMORPHOUS POWDER
Grade I: 94-96% and Grade II: 90-92%
CRYSTALLINE (98% min.) Lump -- Powder

*These Metals and Alloys are available as electronic and special state grades

CALCIUM
STRIP

CESIUM
Packaged in:
GLASS AMPOULES and STAINLESS STEEL CYLINDERS

CHROMIUM
FLAKES

COLUMBIUM
(See Niobium)

GALLIUM*
INGOT IN SQUEEZE BOTTLES

GERMANIUM*
ELECTRONIC, OPTICAL and COMMERCIAL GRADES
INGOT POWDER

INDIUM*
INGOT BAR
SHOT WIRE

LEAD
INGOT BAR
SHOT WIRE

LITHIUM
BATTERY/ELECTRONIC and COMMERCIAL GRADES
INGOTS SHOT WIRE
STRIP DISCS

MOLYBDENUM
FOIL, SHEET, WIRE, ROD

NIOBIUM (Columbium)*
CAPACITOR and METALLURGICAL GRADES
POWDER ROD SHEET
BAR WIRE FOIL
INGOT FINE WIRE EXPANDED MESH
HIGH TEMPERATURE ALLOYS TUBING
SUPERCONDUCTING ALLOYS FABRICATED PARTS

POTASSIUM
Packaged in:
GLASS AMPOULES and STAINLESS STEEL CYLINDERS

*These Metals and Alloys are available as

RUBIDIUM
Packaged in:
GLASS AMPOULES and STAINLESS STEEL CYLINDERS

SELENIUM
PELLETS POWDER GRANULES

SILICON
LUMPS POWDER

TANTALUM*
CAPACITOR and METALLURGICAL GRADES

POWDER	WIRE	EXPANDED MESH
BAR	FINE WIRE	FABRICATED PARTS
INGOT	SHEET	TANTALUM ALLOYS
ROD	FOIL	
PLATE	TUBING	

ALLOYING AGENTS — FOR HIGH TEMPERATURE
NICKEL AND COBALT BASE ALLOYS

TELLURIUM*

SLAB	LUMPS	POWDER
TABLETS	STICKS	

TIN*
INGOT, ROD, WIRE, SHOT

TITANIUM and TITANIUM ALLOYS
TUBING, SEAMLESS

TUNGSTEN
WIRE, STRIP, BAR, SHOT, TARGETS

ZIRCONIUM and ZIRCONIUM ALLOYS
TUBING, SEAMLESS

*These Metals and Alloys are available as electronic and solid state grades.

HIGH PURITY CHEMICALS and COMPOUNDS

BERYLLIUM

BERYLLIUM BASIC ACETATE
BERYLLIUM CARBONATE
BERYLLIUM NITRATE
BERYLLIUM SULFATE
BERYLLIUM FLUORIDE (ANHYDROUS)
BERYLLIUM CHLORIDE (ANHYDROUS)
BERYLLIUM OXIDE
BERYLIDES

BORON

AMMONIUM FLUOBORATE
POTASSIUM FLUOBORATE
SODIUM FLUOBORATE
ALUMINUM BORIDES
NIOBIUM BORIDES
TANTALUM BORIDES
TITANIUM BORIDES
ZIRCONIUM BORIDES
BORIDE COATED REFRACTORY SHAPES
BORON CARBIDE POWDER

CESIUM

CESIUM COMPOUNDS
(Optical, High Purity, Technical Grades)

GALLIUM*

GALLIUM OXIDE

GERMANIUM*

GERMANIUM DIOXIDE
GERMANIUM TETRACHLORIDE
GERMANIUM COMPOUNDS

*These Chemicals and Compounds are available as electronic and solid state grades.

LITHIUM
LITHIUM CARBONATE
LITHIUM COMPOUNDS

NIOBIUM (Columbium)
NIOBIUM BORIDES
NIOBIUM CARBIDE
NIOBIUM NITRIDE
NOBIUM OXALATE
NIOBIUM OXIDE (Optical and Standard Grades)
NIOBIUM PENTACHLORIDE
POTASSIUM NIOBATE
POTASSIUM NIOBIUM FLUORIDE
POTASSIUM NIOBIUM OXYFLUORIDE

RUBIDIUM
RUBIDIUM COMPOUNDS
(High Purity and Technical Grades)

SILICON NITRIDE
POWDER, REACTION BONDED FORMS,
HOT PRESSED FORMS

TANTALUM
TANTALUM BORIDES
TANTALUM CARBIDE
TANTALUM NITRIDE
TANTALUM OXALATE
TANTALUM OXIDE (Optical and Standard Grades)
TANTALUM PENTACHLORIDE
POTASSIUM TANTALUM FLUORIDE

TIN
STANNOUS CHLORIDE

TITANIUM

POTASSIUM TITANIUM FLUORIDE
SODIUM TITANIUM FLUORIDE
TITANIUM BORIDES

YTTRIUM

YTTRIUM OXIDE

ZIRCONIUM

AMMONIUM ZIRCONIUM FLUORIDE
POTASSIUM ZIRCONIUM FLUORIDE
ZIRCONIUM BORIDES

MISCELLANEOUS CHEMICALS

HYDROFLUORIC ACID
MAGNESIUM FLUORIDE
POTASSIUM ALUMINUM FLUORIDE
POTASSIUM SILICOFLUORIDE
RARE EARTH FLUORIDE

SPECIALTY PRODUCTS and SERVICES

BRAZING AND WELDING ALLOY — ROD, RINGS AND COIL

Phos-copper and phos-copper-silver brazing alloys are of high quality and certified to meet all federal and AWS specifications. High purity cathode copper is used in alloy preparation to eliminate detrimental trace elements. All brazing rods are ball burnished to remove rough edges and burrs.

BRAZING ROD ALLOY COMPOSITION

MB-0 Copper—7% Phosphorus
MB-2 Copper—7% Phosphorus—2% Silver
MB-5 Copper—6% Phosphorus—5% Silver
MB-15 Copper—5% Phosphorus—15% Silver

Other Specialty Compositions including Superalloys and Titanium Alloys are available on a custom basis.

Sales Office:

220 East 42nd Street
New York, NY 10017
Phone: 212/682-7143

PLATING SERVICES

Extensive facilities for the continuous electroplating of strip, wire and performed parts are found at the Summit Finishing Division plants in Thomaston, Connecticut and Mooresville, Indiana. Summit has the equipment and experience to handle a broad range of material sizes to the most exacting specifications.

In addition to specializing in continuous selective electroplating, Summit has total capabilities for precision plating of large parts, including critical rotating jet engine components. Tank capacity up to 2,700 gallons is available.

Summit deposits a wide range of plated coating on all types of base metals under strict laboratory controlled supervision.

Sales Office:

1430 Waterbury Road
Thomaston, CT 06787
Phone: 203/283-4391

356 Bridge Street
Mooresville, IN 46158
Phone: 317/831-3160

DRAWN AND FORMED PARTS

Eyelets for Industry, Inc., a subsidiary of KBI, specializes in making drawn and formed parts to

exacting specifications. By emphasizing imaginative engineering and skilled toolmaking, the company has earned an enviable reputation for manufacturing competence and product excellence.

EFI was at first a maker of precision electronic parts. The company has since extended its service to include the automotive, ordnance, electrical, furniture and instrumentation industries. Handling high-production, high-volume jobs, and also prototype development work, the company is now a major source of specialty eyelets for recognized leaders in major industries.

Sales Office:

Eyelets for Industry
1430 Waterbury Road
Thomaston, CT 06787
Phone: 203/283-4391

HIGH TEMPERATURE MATERIALS MACHINED TO PRECISE TOLERANCES

CERAMICS

Aluminum Silicate	Silicon Nitride
Aluminum Oxide	Boron Nitride

GRAPHITE

Assorted grades for specialty applications, including high purity materials

METALS

Tantalum	Stainless Steel
Columbium	Inconel
Molybdenum	Kovar
Tungsten	Titanium

CEMENT AND CASTABLE COMPOUNDS

Duramic S-2 Castable Ceramic
Duramic Hi-Temp Cement

APPLICATIONS

Glass to Metal Sealing	Nozzles
Brazing	Furnace Tooling
Alloying	Dicing Tools
Soldering	Insulators
Welding	Bearings
Metal Evaporation	Jigs
Sintering	Fixtures

Sales Office:

Duramic Products, Inc.
426 Commercial Avenue
Palisades Park, NJ 07650

COATINGS

FLAME SPRAYED COATINGS ON METALS
- Tungsten Carbide
- Ceramics
- Stainless steel
- Molybdenum

CHEMICAL VAPOR DEPOSITED SILICON CARBIDE ON
- Graphite
- Ceramics

Sales Office:

Duramic Products, Inc.
Ringwood Division
1022 Greenwood Lake Road
Ringwood, NJ 07456
Phone: 201/728-8173

BERYLCO SAFETY TOOLS

KBI's Berylco Safety Tool line is comprised of a wide variety of nonsparking beryllium copper tools for use near flammables and explosives. All of these hand tools are rugged, nonmagnetic and corrosion resistant.

The many different types of safety tools available are used extensively in the electronic, chemical, ship, paint and petroleum industries. Berylco beryllium copper is the strongest, hardest material that meets Federal specifications for nonsparking tools.

Sales Office:

Post Office Box 1462
Reading, PA 19603
Phone: 215/929-0781

SPECIALTY METALS — SEAMLESS AND WELD REDUCED TUBING

Zirconium Technology Corporation, a subsidiary of KBI, has the specialized facilities for producing both seamless tubing and the reduction of welded tubing. Working primarily with the high technology specialty metals, Zirtech can process almost any metal capable of cold working in tubular form requiring specifications and tolerances for aerospace or nuclear applications. Sizes from a maximum 1.875″ outside diameter down are available from Zirtech. Custom annealing, in our 35 foot vacuum furnace, is also available with maximum temperature capability of 1600°F.

Zirtech also offers a lightweight, high-strength 3—2.5 titanium alloy golf club shaft.

Sales Office:

Zirconium Technology Corporation
Post Office Box 947
Albany, Oregon 97321
Phone: 503/926-7761

SILICON NITRIDE PRODUCTS

KBI-AME, Inc., a subsidiary of KBI, specializes in silicon nitride powders, fabricated forms by hot pressing or reaction bonding. The fabricated forms cover both standard products and custom shapes to handle a broad range of sizes to the most exacting specifications.

Sales Office:

220 East 42nd Street
New York, NY 10017
Phone: 212/682-7143

CASTINGS

KBI's Precision Cast Products Division is equipped to provide a wide variety of non ferrous alloy castings, including aluminum, brass, bronze, beryllium copper, and beryllium nickel ranging in weight from ounces to approximately 700 pounds. PCP's excellent pattern shop and mold making versatility provides the capability to produce conventional sand castings as well as precision replica castings which require special molding sands and binders or ceramic refractory materials. Patterns are made from wood, metal, acrylic plastics, rubber, epoxies and casting plaster. The particular pattern material or combination of materials is selected on the basis of the casting requirements.

Sales Office:

Precision Cast Products Division
725 East Avenue
Athens, TN 37303
Phone: 615/745-6871

AVAILABLE FACILITIES

HOT AND COLD ISOSTATIC PRESSES — These presses are available on a toll basis for the pressing of metals, alloys, composites and ceramics.

VACUUM HOT PRESSES — KBI's 15 double-acting vacuum hot pressing furnaces will accept dies from 12″ to 60″ in diameter and 36″ to 72″ high.

ROLLING MILL — A versatile, 60-inch, four-high, reversing rolling mill for hot and cold rolling can accommodate varied rolling requirements on a contract basis for metals and alloys including copper, titanium, specialty steels and nickel base alloys.

FOIL MILLS — Four mills can handle foil in thicknesses down to 0.0002 in. Widths vary from 4¼″ to 9″. These mills are equipped with beta ray thickness gages. The facility is equipped with foil slitters.

WIRE DRAWING MACHINES — KBI has precision single and multipass wire drawing machines. The single pass machines are general purpose slow speed machines capable of drawing large diameter wire with a variety of liquid or solid lubricants and a wide span of reductions. The multipass machines draw smaller gages of wire at higher speeds.

ELECTRON BEAM FURNACE — Electron Beam melting in the presence of high vacuum is the best known method for purifying high-melting-point metals and alloys. KBI's furnace produces ingots of finished metals up to 16″ diameter.

PLASMA SPRAYED BERYLLIUM PARTS — Complex beryllium parts and shapes can be produced by plasma spray techniques, achieving excellent physical properties. Process can also be used to produce high strength porous beryllium metal shapes.

Obtain Additional Information and Assistance From:

General Sales Office
NEW YORK, NY
220 East 42nd Street, New York, NY 10017
Phone 212/682-7143/Telex 126332 TWX: 710-581-5199

Beryllium Alloy Sales Office
READING, PA
Box 1462 Reading, PA 19603
Phone: 215/929-0781 TWX: 510-651-0677

Field Sales Offices
ATLANTA, GA
3276 Marjan Dr. NE Atlanta, GA 30340
Phone: 404/458-7824 TWX: 810-757-0150

BOSTON, MA
235 Bear Hill Road Waltham, MA 02154
Phone: 617/890-8270

CHICAGO, IL
1370 Lively Blvd. Elk Grove, IL 60007
Phone: 312/593-3600
TWX 910-222-4570

CLEVELAND, OH
23811 Chagrin Blvd. Cleveland, OH 44122
Phone 216/464-8860

DETROIT, MI
5649 Van Born Court Dearborn, MI 48125
Phone: 313/292-0300 TWX: 810-221-6289

LOS ANGELES, CA
1220 West Walnut Street, Compton, CA 90220
Phone 213/639-5651 TWX 910-346-7703

MONTREAL, CANADA
56 Westland Drive Montreal West 28, Quebec, Canada
Phone 514/484-3307

PALO ALTO, CA
Suite 206, 750 Welch Road Palo Alto, CA 94304
Phone: 415/323-9625

Warehouse distributors located throughout the United States and Canada

International Operations and Sales Offices

CONSOLIDATED BERYLLIUM LIMITED
P.O. Box 5
Milford Haven, Dyfed, Wales
Phone: Milford Haven 2604

N. V. KAWECKI-BILLITON METAALINDUSTRIE
P.O. Box 38
Arnhem, The Netherlands
Phone: Arnhem 629071

DEUTSCHE BERYLLIUM GmbH
Postfach 450
637 Oberursel, West Germany
Phone: Oberursel 5 20 88

SHOWA-KBI COMPANY LIMITED
5-10, 1-Chome, Shiba-Koen Minato-Ku
Tokyo, Japan
Phone: Tokyo 433-0902

KAWECKI-BILLITON (U.K.) LIMITED
659-660 Ajax Avenue
Slough, Berks, SL14DA, England
Phone: Slough 34242

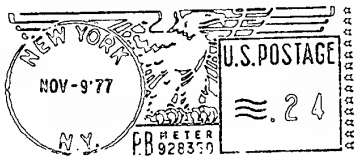
TREFIMETAUX-BERYLCO SA
76-78 Champs Elysees
Paris 8° France
Phone: Paris 359 27 95

Representatives in principal foreign markets.

KAWECKI BERYLCO INDUSTRIES, INC.

GENERAL OFFICES READING, PA. 19603

KAWECKI BERYLCO INDUSTRIES, INC.
220 East 42nd Street, New York, N. Y. 10017



Admiral Stansfield Turner

Director, Central Intelligence Agency

McLean, Virginia 22101

SIDLEY & AUSTIN

ONE FIRST NATIONAL PLAZA
CHICAGO, ILLINOIS 60603
TELEPHONE 312: 329-5400
TELEX 25-4364

Founded in 1866 as
Williams & Thompson

WASHINGTON OFFICE
1730 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, D.C. 20006
TELEPHONE 202: 624-9000
TELEX 89-463

EUROPEAN OFFICE
9 HOLLAND PARK
LONDON, W11 3TH, ENGLAND
TELEPHONE 01: 727-1416
TELEX 21781

November 10, 1977

Adm. Stansfield Turner
Director of Central Intelligence
Central Intelligence Agency
Washington, D.C. 20505

Dear Stan:

I'm so sorry, but I find that I will be out of the City when you are here. I will call you the next time I'm in Washington.

Warmest personal regards.

Sincerely,

Morris I. Leibman

MIL/dm

O/DCI

STAT

TRANSMITTAL SLIP	DATE 16 Nov 77
TO: Prof [redacted]	NFAC
ROOM NO.	BUILDING

REMARKS:

Attached forwarded per DCI's request.

FROM: O/DCI		
ROOM NO. 7D60	BUILDING HQS	[redacted]

FORM NO. 241 1 FEB 55 REPLACES FORM 36-8 WHICH MAY BE USED.

STA

ER file

STAT

[redacted]

November 10, 1977

Admiral Stansfield Turner, Director
Central Intelligence Agency
Washington, D.C. 20505

Dear Sir:

I will very much appreciate your forwarding the enclosed letter to Mr. Richard Helms, whom I consider to be a very heroic and patriotic individual.

Thank you.

Sincerely,

[redacted] STAT

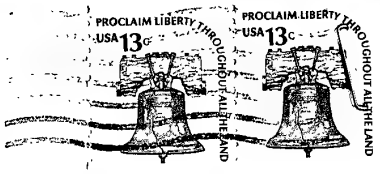
Joseph O. Wagner

EXECUTIVE REGISTRY

JOW/na

encl.

TOMS RIVER N.J. 087
PM
11 NOV
1977



Admiral Stansfield Turner, Director
Central Intelligence Agency
Washington, D.C. 20505

Dear Stan

Love
11/5/77

UNCLASSIFIED | CONFIDENTIAL | SECRET

EXECUTIVE SECRETARIAT

Routing Slip

TO:			ACTION	INFO	DATE	INITIAL
	1	DCI				
	2	DDCI				
	3	D/DCI/IC				
	4	DDS&T				
	5	DDI				
	6	DDA				
	7	DDO				
	8	D/DCI/NI				
	9	GC				
	10	LC				
	11	IG				
	12	Compt				
	13	D/Pers				
	14	D/S				
	15	DTR				
	16	A/DCI/PA				
	17	AO/DCI				
	18	C/IPS				
	19	DCI/SS				
	20					
	21					
	22					
		SUSPENSE _____ Date				

Remarks:

_____ Date

3637 (8-77)

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October 21, 1977

AT [redacted]

President Carter has asked me to respond to your letter and convey his thanks.

You can be assured that careful consideration is given to all suggestions from those who share his concern for the well-being of the nation.

With the President's best wishes,

Sincerely,

Landon Kite

Landon Kite
Staff Assistant

AT [redacted]

The Director of Central Intelligence
Washington, D.C. 20505

Executive Registry
77-3894/2

1 APR 1977

AT [redacted]

How thoughtful of you to write, and to offer such warm words of support after your viewing my appearance on the "Face the Nation" program.

I especially appreciate your comments because of your long-time employment with the CIA. I am certainly conscious of the need to improve the public image of our intelligence activities and intend to do my best on that score.

Again my thanks for writing. I hope you are enjoying your well-earned retirement.

Yours sincerely,

STANSFIELD TURNER
Admiral, U. S. Navy

AT [redacted]

Distribution:
O - Addressee
1 - ER w/basic

EXECUTIVE REGISTRY O/DCI/vlgha

Next 5 Page(s) In Document Exempt

The Director
Central Intelligence Agency

Washington, D.C. 20505

Executive Registry
77-9041/A

O/DCI alpha
2 SEPT

9 NOV 1977

Dear Mr. Butler:

Thank you for sending me a copy of your paper, "The Impact of Technology and Organization on Command and Control." It is encouraging that serious thought is being given particularly to the changes which technology is inevitably making on the ways we have traditionally solved problems.

I appreciate your sharing this interesting work with us.

Yours sincerely,

STANSFIELD TURNER

Mr. Robert A. Butler
Director
The Assessment Group
207 Norman Place
Santa Monica, California
90405

(EXECUTIVE REGISTRY FILE O/DCI/alpha)

1 - DCI
1 - [redacted]
1 - [redacted]
1 - ER